

### ABSTRACT OF THE DISCLOSURE

For generating uniform high-density plasma over a large area with a low power thereby achieving high-quality plasma process at a high speed even at a low temperature, there is provided a microwave plasma processing apparatus

- 5 comprising a plasma generation chamber having a periphery separated from the ambient air by a dielectric member, microwave introduction means utilizing an endless annular wave guide tube provided around the plasma generation chamber and provided with plural slots, a processing chamber connected to the plasma generation chamber, support means for a substrate to be processed provided in the
- 10 processing chamber, gas introduction means for the plasma generation chamber and the processing chamber, and evacuation means for the plasma generation chamber and the processing chamber, wherein the circumferential length  $L_g$  of the endless annular wave guide tube, the wavelength  $\lambda_g$  of the microwave in the endless annular wave guide tube, the circumferential length  $L_s$  of the dielectric
- 15 member and the wavelength  $\lambda_s$  of the surface wave propagating in the dielectric material substantially satisfy a relationship:

$$L_s/\lambda_s = (2n + 1)L_g/\lambda_g$$

wherein  $n$  is 0 or a natural number.

20